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DIVISION OF FORESTRY.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from $1.00 to $2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

C. S. JUDD,
Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207, HONOLULU, HAWAII.

EDW. M. EHRHORN,
Superintendent of Entomology.

THE HAWAIIAN

FORESTER & AGRICULTURIST

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NEW PRESIDENT OF BOARD.

Mr. Arthur H. Rice on December 28, 1915, succeeded Mr. Albert Waterhouse as president of the Board of Agriculture and Forestry. Mr. Waterhouse has served most ably and has devoted much time and valuable thought to the work of the Board during the past year, and it is to the regret of all that he has been compelled to resign the presidency on account of an anticipated protracted absence from the Territory. On the other hand, Mr. Rice's familiarity with the livestock and other agricultural industries in these islands, and his knowledge of the general work of the Board, well qualify him for his new position.

It is a disappointment that the handsome wicker settee made from willows grown at the Makiki Experiment Garden and placed on exhibition at Coyne's during November, together with the offer of the Division of Forestry to supply cuttings to all who desired to grow this willow for the making of wicker articles, failed to elicit one single inquiry of interest. The demand in these islands for wicker furniture, which is most suitable for this climate but which is now imported largely from Connecticut at great cost, offers a lucrative opportunity for a few energetic parties.

The diminution of wild goats and sheep, the consequent rehabilitation of native grasses and weeds, and the rapid spread of the algaroba over a large part of the island of Kahoolawe, together with the success already attained in the establishment of highland ironwood trees and the valuable fodder and soil-binding grass, *Paspalum dililatum*, on parts of this somewhat barren island, already seem to justify its creation as a forest reserve.

The regulation concerning the quarantine of all dogs imported from rabies-infested countries does not appear to work many hardships on dog fanciers. The kennels at the Honolulu animal quarantine station are constantly almost full and new animals come from the Coast with almost every freight steamer. A news article on a fight against rabies the federal government has started in the far west is deferred until February on account of lack of space in the present number.

The appointment in November, 1915, of two new forest rangers, E. H. Hipple for Palolo, Manoa and Nuuanu valleys in the Honolulu Watershed forest reserve, Oahu, and John Pililaau for the forest reserves in the Waianae district, marks a distinct advancement in the better administration of the Territorial forest reserves toward which the Division of Forestry is striving.

The reduction in infantile mortality on Oahu from 26 in 1910-11 to 3 in 1914-15, as shown by the report of the Territorial Veterinarian, coincident with the inauguration and vigorous prosecution of the campaign to eradicate bovine tuberculosis from the Territory, is significant. With purer milk the babies have a better chance for life.

In his search for parasites on the melon fly, Field Entomologist David T. Fullaway spent September in Singapore, moved on to Buitenzorg, Java, and then to Bangalore, India. From last accounts he was on his way back to Manila.

In the effort to make Honolulu a more beautiful city the Board is coöperating with the City and County, through the Outdoor Circle, by furnishing manure and mahogany trees free of charge for the Kalakaua Avenue parking.

The fencing of the Territorial forests along the Volcano Road on Hawaii by the Division of Forestry, to keep out wandering stock, will preserve for the enjoyment of tourists from all parts of the world what remains of the charming native forest woodlands along this scenic ride.

The cloth notices posted by the Territorial Forester along conspicuous highways and trails on the Honolulu Watershed forest reserve have begun to make the people realize that this reserve was created for a definite and beneficial purpose.

The strict inspection made by the Division of Entomology of all fruit shipments from the Coast results in the placing of better fruit in better condition on the Honolulu market.

CORRECTED TREE PLANTING RECORD.

Honolulu, December 28, 1915.

Editor Hawaiian Forester and Agriculturist:

Sir:—Owing to typographical errors and omissions which occurred in the table showing the number of trees planted on all the islands during the calendar years of 1913 and 1914, which was printed on page 71 of the report of the Board of Commissioners of Agriculture and Forestry for the biennial period ended December 31, 1914, I beg to transmit the following corrected table which I should be glad to have appear in an early issue of the Hawaiian Forester and Agriculturist.

In order to obtain the full and correct number of trees planted during 1915, I am about to send out a reply postal card and it is my hope that this will be filled out by all tree planters in the Territory and promptly returned to this office.

Very sincerely yours,

C. S. JUDD,
Superintendent of Forestry.

NUMBER OF TREES PLANTED IN THE TERRITORY OF HAWAII, PRINCIPALLY BY CORPORATIONS, IN 1913 AND 1914.

Kauai.

	1913	1914	Total
Koloa Sugar Co.	11,199	5,901	17,100
McBryde Sugar Co.	17,839	17,839	35,678
Grove Farm Plantation.	25,000	65,000	90,000
Makee Sugar Co.	30,000	20.100	50,100
Papapaholahola Spring Reserve.	18,544	20,381	38,925
	102,582	129,221	231,803

Oahu.

Waialua Agricultural Co.	125,000	125,000	250,000
Honolulu Plantation Co.	.....	30,000	30,000
	125,000	155,000	280,000

Hawaii.

Pacific Sugar Mill.	.....	10,000	10,000
Hawaiian Agricultural Co.	7,000	7,000	14,000
Kukaiau Ranch	99,450	165,920	265,370
Parker Ranch	33,832	96,394	130,226
Kukaiau Plantation Co.	2,000	2,000	4,000

Niulii Sugar Mill and Plantation....	.....	1,700	1,700
Honokaa Sugar Co.....	10,000	10,000	20,000
Puakea Plantation Co.....	580	580	1,160
Waiohinu Homesteads.....	.....	2,000	2,000
Hilo District, from Hilo sub-nursery.	10,066	10,868	20,934
	162,928	306,462	469,390

Maui.

Maui Agricultural Co.....	.....	255,035	255,035
Wailuku Sugar Co.....	19,661	29,261	48,922
Polipoli, government lands.....	4,653	11,187	15,840
Honolua Ranch	2,000	3,500	5,500
Cornwell Ranch	.....	32,000	32,000
Lanai Company, Ltd.....	9,000	1,340	10,340
Haiku Homesteads.....	5,000	4,000	9,000
	40,314	336,323	376,637
Total number of trees planted on all islands 430,824		927,006	1,357,830

DIVISION OF ANIMAL INDUSTRY.

Honolulu, November 26, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I beg to submit herewith my report on the work of the Division of Animal Industry for the month of October, 1915:

Bovine Tuberculosis.

The annual tuberculin testing of all dairy cattle in the City and County of Honolulu, as by municipal ordinance required, has nearly been finished, there remaining only some of the railroad ranches' cattle still to be submitted to the test. These untested cows can hardly be classified as dairy cattle, their milk being used for human consumption only in part and for a very limited period. Properly speaking the animals in question are range cattle, which, for the purpose of gentling the calves, are rounded up and handled for a varying length of time, from one month to six weeks, during which period their surplus milk is sometimes sold or otherwise disposed of for human consumption. So in order to comply with the above mentioned "milk ordinance" and at the same time obtain reliable information as to the health of the cows so far as bovine tuberculosis is concerned the not inconsiderable task of rounding up, confining, in-

jecting with tuberculin, inspecting, ear-marking or branding a few thousand half wild cows is gone through with, regularly, once a year. As tuberculosis occurs but very rarely among this class of animals, and as the quantity of milk obtained from them is too small to pay for the cost of the labor required the undertaking might, except for the gentling of the calves, be considered philanthropic, were it not for the few centers of tuberculous infection which thereby have been removed from these otherwise healthy herds. At any rate the tuberculin testing of such a large number of temporary milch cows, with only a fraction of one per cent. of infected animals among them, has caused a decided reduction in the figure of final results, highly satisfactory, though to a certain extent misleading. In other words the percentage of infection with bovine tuberculosis on the island of Oahu is annually lowered nearly one per cent. by counting the cows of the railroad ranches as dairy cattle instead of range cattle. At the present time, for instance, with all actual dairy herds tested, the percentage of infection is well above 4, though not reaching 4.5. With the railroad cows added, this figure will probably be reduced to between 3 and 3.5, which fact it has seemed desirable to emphasize in view of the unusual conditions discussed in my last report and which were responsible for the advance of this figure from 2.88 of last year.

In response to an invitation from the Hawaiian Medical Association a paper entitled, "Bovine Tuberculosis; Its Economic Importance; Territorial and Municipal Measures of Suppression and Eradication," was read at the annual meeting which was held in Honolulu during the first week of the present month. A copy of this paper is appended herewith for the information of the members of the board, and attention is especially called to the section pertaining to the enormous sum which the milk consuming public has paid the milk producers for condemned reacting cows. While the figures quoted (an increase in the price of milk of 2 cents per quart on 9000 quarts daily for five years) are very conservative, the question as to what part of the aggregate should be charged to increased cost of production remains open. Labor has undoubtedly increased in cost, but feed prices have not, so far as can be estimated by a comparison of prices, advanced sufficiently to warrant an increase of more than one cent per quart of milk. If this estimate is correct it is found that the consumer has paid an average of about $100 per head for each of the 1500 head of condemned reactors, in addition to which the owners have received an average of $25.00 per head for the carcasses.

The new "Sanitary Code" promulgated by the Territorial Board of Health under date of August 18, 1915, contains a paragraph of great importance to the work of eradicating bovine tuberculosis, in that it requires the tuberculin testing, by a government veterinarian, of all dairy cattle in the Territory before a license to sell milk can be issued. In other words, it extends the authority hitherto supplied on the island of Oahu alone by the

municipal milk ordinance to the entire Territory; and, while it apparently applies only to cows whose milk is to be sold, it is believed the code is sufficiently comprehensive to embrace also the family cow and private dairies from which milk is given away. It would, therefore, seem the time has come for a vigorous campaign against the tuberculous cow on the other islands, and especially on Hawaii and Kauai, where infantile tuberculosis during the year ending June 30, 1915, showed a mortality three times as large as that of Oahu (9 deaths as compared to 3), and more than twice as large during the two immediately preceding years. From figures furnished by the Territorial registrar general, the infantile mortality (children under 5 years of age) from tuberculosis amounted on Oahu alone to 26 cases in 1910-11, when the campaign against the tuberculous canvass was begun. As the vital statistics from the period previous to 1912 or 1913 were deficient and as the Anti-tuberculosis League had not yet commenced its educational campaign, many cases were undoubtedly never reported or else reported under headings other than tuberculosis. Beginning, however, with these 26 authentic deaths in 1910-11, the City and County of Honolulu shows the following reduction in mortality:

1910-11	26
1911-12	15
1912-13	8
1913-14	9
1914-15	3

In other words *where five years ago nine children died from tuberculosis only one died last year.*

On the other islands taken together, the corresponding figures show:

1910-11	18
1911-12	14
1912-13	17
1913-14	14
1914-15	9

In other words a reduction of two to one for these three counties, or for the entire Territory from 44 deaths in 1910-11 to 12 in 1914-15—approximately 4 to 1.

As a specific instance, and illustrating what even partial efforts at suppression may accomplish in the face of opposition, may be mentioned the island of Kauai. In 1913 the president of the Territorial Board of Health called our attention to the continued great mortality from tuberculosis among the children on Kauai, and suggested the possible cause to be the prevalence of bovine tuberculosis on that island. These facts were referred to the Deputy Territorial Veterinarian on Kauai, requesting him to

take such action in the matter as local circumstances would permit. The vital statistics for the island showed the following number of deaths from tuberculosis in children under five years:

1910-11	11
1911-12	10
1912-13	8

or in each case from two to three times as many deaths as on Maui and Hawaii together. The Deputy Veterinarian shortly reported having found about 25 per cent. of tuberculous cows in one of the largest dairies on the island, and their subsequent destruction. The mortality for the following years showed:

1913-14	2
1914-15	3

or, where previous to 1913 four or five babies died from tuberculosis, only one died after but partial cleaning up of the island.

It would seem that further proof would be superfluous, and still it may be as well here to quote from my paper before the Medical Association above referred to, in which a prominent English pathologist after careful microscopic examination of the excised glands of 72 children suffering from scrofulosis (tuberculous enlargement of the lymph glands of the neck) found 90 per cent. of the infection to be of bovine origin, and further proved that 85 per cent. of these children had been fed on milk from untested cows.

A circular letter to the Deputy Territorial Veterinarians on Hawaii, Maui and Kauai has been prepared and sent to them with instructions to coöperate with the local representative of the Territorial Board of Health on their respective islands in enforcing the new Sanitary Code. On Hawaii Dr. Elliot has already begun testing the dairy herds in Kohala and North and South Kona, having secured leave of absence from his duties in Hilo. He is accompanied by a Board of Health inspector who acts as advance agent, travelling several days ahead of him arranging dates and places for testing, and impressing upon the milk producers that no license to sell milk will be issued until a clean bill of health, based on the tuberculin test, has been issued by Dr. Elliot. While all dairy cows have already been tested in Hamakua, North and South Hilo, Kona and Kau, a retest will be required before the new license is forthcoming.

Kauai and Maui have not been heard from as yet, but energetic steps will no doubt be taken there also as soon as the fact is realized that the long wanted authority on which to act has now been supplied. That human life is being wasted and that no term less than criminal negligence can be applied to a continuation of conditions which tolerate the presence of tuberculous infection on premises where milk for human consumption is being produced,

must be realized and must be acted upon without further delay. The new Sanitary Code puts the official approval of the Territorial Board of Health on this Board's efforts at eradicating bovine tuberculosis, and the vital statistics of the Registrar General prove beyond doubt an immense decrease in the mortality among children from tuberculous infection, so, whether due to the elimination of the tuberculous cow or to the efforts of the Anti-Tuberculosis League, or to both, the time has come when these factors must be applied to the fullest extent, and with coöperation among the various sanitary authorities, it should not be long before the last remnant of bovine tuberculosis has finally been eradicated from the Territory.

The hog cholera situation being dealt with at length in the appended report by Dr. Case, it only remains to state that an investigation of the new method of vaccinating poultry against sore-head, roup or chicken pox is well under way and will be dealt with in a special article which is now being prepared for publication. It may be said, however, that results obtained so far look very promising and warrant the hope that this disease, which for years has acted as a check on the poultry industry of the Territory, may soon be under complete control.

Respectfully submitted,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT VETERINARIAN.

Honolulu, November 10, 1915.

Dr. Victor A. Nörgaard,
Chief of Division of Animal Industry.

Sir:—I have the honor to submit the following report for the month of October, 1915:

Tuberculosis Control.

The following dairy cattle have been tuberculin tested during the past month:

Name	Total	Passed	Condemned
S. Okuma	9	9	0
William Meyer	20	20	0
T. F. Farm	103	89	14
W. P. Alexander	5	4	1
G. Ikedo	9	9	0
M. Nee	14	14	0
A. F. Cooke	9	8	1
J. M. Whitney	13	13	0
A. L. C. Atkinson	48	47	1

Name	Total	Passed	Condemned
College of Hawaii	22	21	1
M. Kawamura	7	7	0
Mills Schools	18	17	1
Oahu College	17	17	0
Frank Ralph	7	7	0
S. Tsumoto	8	8	0
M. Quintal	5	5	0
J. A. Vierra	3	3	0
A. N. Campbell	2	2	0
Lunalilo Home	21	21	0
J. P. Mendonca	11	11	0
D. Tello	2	2	0
F. L. Whitney	3	2	1
A. F. Cooke	1	1	0
Girls' Industrial School	7	7	0
John Gomes	6	6	0
T. Gouviera	3	3	0
M. M. Pedro	5	5	0
M. T. Brazon	13	13	0
J. A. Castro	8	8	0
John Alias	4	4	0
M. Pacheco	4	3	1
Salvation Army Home	5	4	1
K. Mitsunago	4	3	1
H. Focke	5	5	0
S. Tado	16	16	0
I. Morioto	7	7	0

From the above tabulated list it will be seen that a total of 444 head of dairy cattle were tested during the month, out of which number 421 were passed and tagged and 23 condemned and branded. Of the number of condemned animals, 7 have been slaughtered at the different abattoirs, tubercular lesions being found in every instance, and 16 are segregated awaiting slaughter.

Hog Cholera.

A number of inspections were made at different piggeries, as follows: 5 Chinese; 20 Japanese in Moiliili district, and at Pond's and Kawahara's beyond Leilehua, a total of 2200 head of hogs being examined.

In Moiliili almost without exception the hogs were in the finest condition and according to statements from the various owners no loss has occurred since three years ago—1912—when they all experienced heavy losses, many being wiped out of business entirely. While it may be said that correct information regarding loss is hard to obtain, all evidence goes to show that there is no loss occurring in these piggeries at the present

time from hog cholera. This statement must not be construed to mean that the organisms of hog cholera are not present in this district, as this could hardly be possible after such a severe outbreak as has been reported, and while undoubtedly there they are so attenuated in vitality as to cause no loss among the hogs.

Since the last outbreak of cholera in the above district there has been considerable improvement in the care of the animals and the sanitary and hygienic condition of their surroundings, this has had the effect of raising the vitality of the hogs to the point where they are able to resist the attenuated infection which may be present. No serum is used by any of the above hog raisers, in fact they have never heard of such a thing as serum.

The feed in every instance consisted of slop, rice bran or middlings, taro tops and pig weed in varying proportions. All slop is cooked together with the green stuff and afterward the grain is added.

In Kawahara's piggery very similar conditions prevail. There are in the neighborhood of 450 hogs, small and large, and with very few exceptions all are in fine condition. As far as I was able to learn no loss attributable to cholera has occurred in a long time. No serum is used. The sanitary and hygienic conditions could be greatly improved. Between 40 and 50 hogs averaging about 135 pounds each are shipped to the Honolulu market every month.

No slop is fed at the present time and in fact since Mr. Pond secured the contract for the Schofield Barracks swill. The feed now consists of a mixture of rolled barley and rice bran in the proportion of two bags of rice bran to one bag of barley together with a varying amount of green stuff of different kinds. The rolled barley is cooked before it is fed, the rice bran being added afterward and the green stuff fed as it is cut. Breeding sows and boars get only the rice bran and green stuff, no barley, only those pigs being fattened for market get the full mixture. They seem to do remarkably well on it, gaining weight rapidly.

At Mr. Pond's pig farm many improvements are taking place. Many new buildings are going up and rapid strides are being made in hygiene and sanitation. No cases of hog cholera have occurred in several months and to all appearances the outbreak is now under absolute control.

In conclusion it may be stated that while an attenuated form of cholera infection may be and probably is present in a number of districts on this island, the actual loss from this disease at the present time is practically nil.

Importation of Live Stock.

S. S. Manoa, San Francisco—10 cts. poultry.

S. S. Matsonia, San Francisco—2 cts. poultry, 3 dogs, 1 cat, J. F. Colburn; 1 ct. pigeons, P. Silva; 1 bx. white mice, U. S. L. Ex. Sta.; 1 dog, Wm. Dykes; 1 dog, L. Barnett.

S. S. Lurline, San Francisco—1 horse; Ant. Schmer; 4 cts. poultry, J. C. Rued; 1 ct. doves, E. O. Hall & Son; 7 Holstein cows, 1 Holstein bull, 2 hogs, Kamehameha Schools.

S. S. Wilhelmina, San Francisco—1 dog, Mrs. C. Meade; 15 cts. poultry.

Respectfully submitted,

LEONARD N. CASE,
Assistant Territorial Veterinarian.

BOVINE TUBERCULOSIS.

ITS RELATION TO PUBLIC HEALTH; MUNICIPAL AND TERRITORIAL CONTROL AND SUPPRESSION; ECONOMIC IMPORTANCE.

(Paper read by Dr. V. A. Nörgaard, Territorial Veterinarian, before the Hawaiian Medical Association, November, 1915.)

Mr. President, Members of the Association:

The past year has seen but insignificant changes as regards the medical profession's standpoint relative to the subject under discussion. Practically all scientific men consider the question as having been definitely settled in favor of the view that bovine tuberculosis is transmissible to human beings, and especially to children.

What remains to be determined is the actual percentage of cases due to the bovine infection, or, in other words, the public health importance of the bovine disease.

In spite of the general acceptance of the theory of transmissibility, there occasionally appear articles opposing this view, and especially in countries where the work of eradication of bovine tuberculosis is being pushed. In Sweden for instance, where Prof. John Wennerholm now for several years has endeavored to reduce the number of infected herds by means of the Bang system of segregation, an article has appeared covering the autopsy reports of not less than 7,630 children, which died during the first year of life at the Stockholm Municipal Hospital during the years 1842 to 1911. Six hundred and twenty-three cases showed tuberculous lesions, of which number only six showed lesions exclusively in the intestines and mesenteric glands. In thirty years' experience, says the writer, (Prof. Wedin in Arch. f. Kinderh., 1913) he has never seen a case of tuberculosis which he could ascribe to infection through milk.

This paper is quoted by Dr. Ravenel at the last meeting of the American Association of Medical Milk Commissions for the purpose of warning against that sort of testimony. "Bacteriological examination," he continued, "has proven the impossibility of detecting bovine tuberculosis clinically. It is also impossible to

determine the portal of entrance by what appears post-mortem to be the oldest lesions. It has further been proven—by Baumgarten, twenty years ago—that the tubercle bacillus can penetrate the mucous membrane of the intestine and reach the lung without causing lesions at the point of entrance."

Prof. Wedin's paper is, therefore, of importance only as illustrating the kind of reasoning which has led to so much error on this question in the past.

In straight contrast to this is a paper by Dr. A. P. Mitchell (British Med. Journal, Jan., 1914), covering the examination of the cervical glands of 72 scrofulous children under 12 years of age. He summarizes his results as follows:

0-8 years—human, 4; bovine, 30.
5-12 years—human, 3; bovine, 35.

And adds that 84 per cent. of the cases two years old or under were fed on unsterilized cow's milk. "This," says Dr. Ravenel, "illustrates strikingly that in addition to the deaths caused in children by the bovine tubercle bacillus, a very large percentage of the tuberculous deformities also come from the same source."

The importance of bovine tuberculosis must therefore be considered a factor of immense importance in so far as public health is concerned, and as pasteurization alone has been found impossible of enforcement, our efforts must be bent on suppression and eradication of the source of infection.

Tuberculin Testing of Dairy Cattle in the City and County of Honolulu and in the Territory.

The past year did not prove favorable to the work of eradicating bovine tuberculosis, as undertaken and adhered to by the Board of Agriculture and Forestry since 1910.

By the end of 1914 a point had been reached which seemed to justify our hopes that complete eradication, at least in so far as the island of Oahu was concerned, was within reach. The number of reacting animals had been reduced to nearly 2 per cent. from more than 30 per cent., and with the removal of these last reactors to the slaughter house and the disinfection of the premises where they had been kept, it was believed that the time had come when complete eradication might be accelerated by encouraging those dairymen who still had the infection in their herds, to closer coöperation with the Board of Agriculture and Forestry by obtaining financial support from the legislature then shortly to convene. With this end in view, a bill providing for the indemnification of owners of tuberculous cattle was prepared and introduced, and it is believed was favorably received and promised support to the extent of $10,000. This sum would have been sufficient to greatly relieve the few dairy owners whom it was thought still had any considerable number of diseased animals in their stables. But, to the surprise of everybody concerned, the bill was killed in committee by the very people for the benefit

of whom it was conceived. A bill substituting pasteurization for the tuberculin test, or leaving the choice of either method to the individual dairyman, was considered but failed of acceptance.

In the meantime the regular tuberculin test of a number of dairies had been postponed from time to time until a point was reached where the Board of Agriculture and Forestry was confronted with the question of either abandoning the work so well begun and so nearly finished, or else obtain the enforcing of the municipal milk ordinance which requires that cows furnishing milk for human consumption must be free from tuberculosis. The dairymen yielded and testing was resumed, and the results demonstrated clearly how little time it takes for the tubercular infection to spread through a herd so long as a trace of it is left. Several of the dairies which had not been tested for a year to a year and a half showed from fifteen to twenty-five per cent. reactors, while one of the largest dairies where the infection had been almost universal from the beginning but where testing had been continued regularly, showed the smallest number of reactors on record, slightly more than one per cent. out of several hundred animals. It was also demonstrated that practically every dairy where the disease had once been cleaned out and where care had been exercised in not introducing any but healthy tested animals, remained free from the disease. This goes to prove that when once eradicated the disease must be brought in from abroad in order to gain a new foothold here, and that can, with our present laws and regulations, be prevented, the same as has been done in the island of Jersey these many years.

The work of eradication is now well under way again, and while the annual crop of reactors will more than double that of the preceding year, there is every reason to believe the ultimate object of complete eradication is not far distant even though its consummation has been delayed.

On the islands of Hawaii, Maui and Kauai, where no milk ordinance requiring the tuberculin test has been effective, the work of eradicating tuberculosis has of necessity been slower. Much good work has, however, been done, especially on Hawaii where the Deputy Territorial Veterinarian, Dr. Elliot, has been working hand in hand with the local Board of Health authorities. All dairy cattle in the Hamakua, Hilo, Puna and Kau districts have been tested and the reactors eliminated from the herds, and the work will soon be extended to the entire island. Considering the distance to be covered you will understand that this is no small undertaking for one man whose principal duties require his presence almost constantly in or near Hilo, but all of you who know Dr. Elliot also know that he will accomplish it. That he is thoroughly interested in the work and understands the requirements and the ultimate aim of it is best demonstrated by reading his contribution to this paper.

On Maui and Kauai only such dairy herds have been tested as

the owners have volunteered or been persuaded to clean up. The large plantation dairies have nearly all been tested and many private owners have seen the necessity for eliminating the danger of infection through tuberculous milk. A new era will undoubtedly begin with the enforcement of the

Sanitary Code of the Territorial Board of Health of August 18, 1915.

This code requires the testing for tuberculosis of all cows in the Territory whose milk is sold for human consumption. While it leaves out the private owner and protects the family cow against the test, it will, nevertheless, be of immense support in the work of eradication. Had this code been promulgated a few years ago, the Territory would, in my opinion, have been free of tuberculosis by this time. But late is better than never, and I have great hopes that the new code will prevent any such delays in the work as that already described. The Territory is now actually in the fight against this dangerous though preventable disease, and the authority which the code lends to those upon whom the actual work of eradication falls cannot be overestimated.

Infantile Mortality from Tuberculosis.

In my paper before the Association last year I mentioned the apparent decrease in the number of deaths among infants under five years of age, which appears to have occurred in the City and County of Honolulu coincidentally with the elimination of the tuberculous infection from the market milk. This decrease seems to be accentuated through the latest report of the Registrar General, if I interpret the figures furnished me correctly. In this connection it may be mentioned that similar observations have been made in other countries, notably England, where the health authorities in Leeds and Manchester both agree that a notable decrease in infantile tuberculosis has occurred in direct proportion to elimination of the tuberculous cow. The Manchester method, which consists in tuberculin testing and removal from the dairies of the reactors, in constantly widening circles or by definite districts, is accepted as most practical in many parts of England, and the results have been most gratifying, especially where eradication has gone hand in hand with pasteurization. This means that where, for economic reasons, all reactors cannot be destroyed at once, they are segregated and their milk pasteurized before it can be used for human consumption. Board of Health statistics from Leeds, Manchester and other cities where practiced, have shown so decided a decline in the mortality of children under five years of age that it exceeded that of many smaller but wealthy municipalities where social uplift clubs and anti-tuberculous leagues claimed the reduction due to the better

sanitary conditions in the homes of the laboring classes, resulting from their work, there is still a margin of lessened mortality from infantile tuberculosis which can be observed only in those districts where the tuberculous infection has been reduced or entirely removed from the market milk, whether by testing or by pasteurization, a fact which is easily understood when we recall Dr. Mitchell's already quoted statement that 84 per cent. of children under 2 years of age and suffering from scrofulosis were fed on unpasteurized milk and showed infection with the bovine form of the tubercle bacillus. Similar observations made by Dr. Park of New York and by many other prominent investigators were quoted in my paper before this Association last year, and Dr. Mitchell's observations may, therefore, be considered as confirming these. With such evidence before us, we can no longer afford to quibble and waste time on recalcitrant obstructionists, who in most cases are endeavoring to further personal aims or ambitions by appearing to champion the cause of the overburdened milk producer who cannot "afford" to rid his herd of tuberculous cows.

That bovine tuberculosis can be eradicated without actual loss to the milk producer and without indemnifying the owner of condemned cows out of public funds, has been amply demonstrated here. With the passing of the municipal milk ordinance of the City and County of Honolulu in 1910, it became a misdemeanor to sell milk from cows affected with tuberculosis and to obtain a license to sell milk the applicant must present a certificate showing that his herd had been tested with tuberculin and found free from tuberculosis. While the ordinance provided that the test should be made without cost to the owner, no provision was made for the disposal of the reacting animals or for the reimbursement of the owner who had to send a greater or less percentage of his herd to the slaughter house. The dairymen consequently did the only possible thing that could be done in the premises, that is, they raised the price of milk. If the milk consuming public wanted milk from tuberculin tested herds they must pay for it. Whether this point of view was correct is a question. The milk consumer undoubtedly received the most direct benefit from the measure, but being preliminarily a public health measure, originated and enforced by government officers, and one of grave import to the entire community, whether milk consumer or not, the question as to whether the consumer alone should pay for the protection of the entire community naturally presents itself. The demand for clean milk was, however, so strong that the increase of 25 per cent. in the cost of milk to the consumer caused but little objection and apparently had little effect upon the quantity consumed. Milk rose in price from 10 cents to 12½ cents per quart in Honolulu, a few independent milk producers, mostly Orientals, selling at 12 cents flat. With an average consumption of 9000 quarts per day an increase of but 2 cents per quart would mean $160.00 every day, or $65,700.00 per annum paid by the

milk consumer for milk from tuberculin tested cows. During the five years which have been devoted to eradication of the tuberculous dairy cow, an aggregate of 1500 condemned reactors have been butchered. For these animals the milk consumers have paid $328,500.00 or $219.00 per head. As the carcasses of these animals have realized the owners at least $20.00 each, it would appear that if these $239.00 per head could all be charged as paid by the consumer for condemned cattle exclusively, the milk producer had been well paid. Such, however, is not the case. The cost of production of milk has increased considerably during the period under consideration, and it is possible that had it not been for the already very high price of milk, and a price which has been paid without complaint by the consumer so long as he thought his family was being actually protected against at least one source of infection from tuberculosis, the price would undoubtedly have been raised long ago. Allowing one cent per quart for the increased cost of production during the past five years, the average price paid for each condemned cow may be placed at $120.00, which is probably very close to the average for which these animals could have been replaced.

So, whether just or unjust, the consumer has tacitly agreed to pay for clean milk from healthy cows, and is entitled to get what he pays for. On the other hand the producer has repeatedly signified that he prefers to get his remuneration for condemned cows directly from the consumer, instead of by official appraisal and indemnification. And, finally, as existing statutes and regulations allow for no other solution of the subject, it would seem as if the way is now open for final eradication of bovine tuberculosis on the island of Oahu, and for the earnest extension of the work to the other islands. I, therefore, wish in conclusion to ask all the members of this Association to help along, whenever the opportunity presents itself, to further the interest in and the demand for *clean milk* from *healthy cows*. One cent or two per day is a good investment if it prevents a case of tuberculosis in the family.

Discussion of Paper.

The discussion of Dr. Nörgaard's paper was opened by Dr. Sinclair.

Dr. Nörgaard, following Dr. Sinclair, said:

I wish to add only a few words in regard to the general milk supply of Honolulu at the present time.

To the most casual observer a great improvement in dairy sanitation and in the handling and care of the milk, as well as the animals, is plainly visible, especially if the observer was at all familiar with the conditions of five years ago. The constant visits of the tuberculin testing officials, a word of approval or praise, a timely suggestion of improvements as to methods and

means, or perhaps, in rare cases, a word of warning about unpleasant consequences if necessary improvements should not be forthcoming within a week, have in most cases worked toward a better understanding of the most elementary requirements for the production of clean milk and subsequently to an actual desire for improvements which hitherto had been regarded as unnecessary and expensive, evils to be dodged whenever possible. Many of the smaller Oriental dairies are now as clean as the proverbial dutch kitchen, and what counts heavier, on account of the larger numbers of cattle and the greater expense involved, quite a number of the larger dairies have either built entirely new barns or stables, or reconstructed and modernized the old ones. Among these should be mentioned Mr. Charles Bellina's and Mr. Frank Andrade's, the former being a new stable with 196 stanchions made of galvanized iron pipe set in a concrete foundation. A central feed alley is provided with rails on which move the feed cars. In the center of the stable is a turnstile by means of which the cars can be run to the various feed boxes, or else be filled with chopped green feed—alfalfa or Sudan grass from a storage room above, to which the feed is blown through tubes from the cutter located in a separate building beside the stable. The mangers are concrete with smooth cement surfaces, partitioned off for each cow with hinged galvanized iron partition which can be raised so as to allow the entire manger to be flushed clean with water. The floors are concrete, graded to the gutters, all of which slant to a general outlet from where the manure is flushed through pipes and flumes directly back to the alfalfa or Sudan fields. A great improvement has been made in the manner of collecting the milk, in that the large collecting cans (40 gallons) have been placed in enclosed boxes with sliding doors and situated on the outside of the rails behind the cows, but well out of range of the splash from the gutters and the swish of the tails. When full these containers are carried on a low truck to a wire conveyor on which they slide to the milk room some distance from the stable. Mr. Bellina is one of the largest milk producers in Honolulu at the present time, and great credit is due for his foresight and confidence in the future of the local milk problem.

The same may be said of Mr. Andrade, Mr. Lucas, Mr. Love and many others, and though much still remains to be done, there is evidence of progress in nearly every direction.

At this Association's meeting last year a great number of questions were asked in regard to Honolulu Dairymen's Association's establishment on Sheridan street. While no inquiries have been made this time, I nevertheless shall use this opportunity to state that the interest then taken in that concern by the medical profession undoubtedly was conducive to the far-reaching improvements which have been effected during the past year. The steam sterilization of bottles and containers has been perfected, the milk room proper has been made absolutely fly-proof and the walls made as smooth as enamel. An ice cream factory has been

established, and its products are guaranteed always to be up to the official requirements as to milk fat, natural flavors and absence of chemicals and preservatives. All the milk is carefully strained, electrically treated by a process which practically pasteurizes it without leaving any taste, usually noticeable in ordinary pasteurized milk. As this Association handles nearly 75 per cent. of the milk consumed in Honolulu, and as the process carries with it the cooling of the milk to nearly 40° F., its beneficial effect is obvious, especially as the official requirements are complied with so long as the milk producer cools his milk to 77° F., which is practically no cooling at all as this temperature hardly inhibits the development of micro-organisms in any perceptible degree. Cold storage rooms, ice machine and artesian well are some of the other improvements of the Association's worth mentioning, and scrupulous cleanliness is enforced throughout every step in the preparation of the milk and its products for local market. So long as these conditions prevail I can recommend the Association's products to the practicing physicians of Honolulu, and would suggest that a visit to the premises would, perhaps more than anything I can tell you, convince you of the truth of my statements.

DIVISION OF ENTOMOLOGY.

Honolulu, November 15, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report of the work performed by the Division of Entomology for the month of October, 1915, as follows:

During the month 44 vessels arrived at the port of Honolulu, of which 15 carried vegetable matter. Of these vessels, 7 passed through the Panama canal.

Disposal	*Lots*	*Parcels*
Passed as free from pests	1210	21,393
Fumigated	3	6
Burned	19	20
Returned	4	8
Total inspected	1236	21,427

Of these shipments 21,160 packages arrived as freight, 148 packages as mail matter and 119 packages as baggage of passengers and immigrants.

Rice and Bean Shipments.

During the month 25,853 bags of rice and 6175 bags of beans arrived from Japan, all of which was found free from pests and was allowed to enter the Territory.

Pests Intercepted.

Eighteen packages of fruit were taken from passengers and immigrants coming from foreign countries and were destroyed by burning.

Six ornamental plants arrived by the transport Dix from Japan and as the consignee had no permit from the Federal Horticultural Board for this shipment they were refused entry.

Four cases of rose plants from California had to be fumigated on account of being infested with rose aphis. A cactus plant from Japan was fumigated and the soil removed from its roots as a precautionary measure.

One package of tree seed and one package of bulbs arriving by mail from Japan were returned to shipper as being unmailable under ruling of the Federal Horticultural Board.

All shipments of fruit and vegetables coming from the Coast were in very excellent condition in regard to quality and all shipments were free from infestation. While on a visit to California I called on the various shipping firms who have consignees here and impressed upon them the necessity of shipping the very best products for our consumption. I also explained to them that owing to the six-day trip, particular care should be exercised in selecting the best shipping varieties as all soft fruits invariably showed ill effects from a long journey.

Beneficial Insects.

During the month of October the following parasites of fruit-flies have been bred:

Tetrastichus giffardii	20,600
Diachasma fullawayi	961
Diachasma tryoni	714
Total bred	22,275

Including the usual quota of parasites of the horn, house and stable fly bred during the month, the following parasites were liberated in various sections:

Tetrastichus giffardii	18,400
Diachasma fullawayi	916
Diachasma tryoni	679
African spalangia	1,600
Philippine spalangia	1,500
African Hornfly	1,400
Philippine Pteromalid	1,200
Total distributed	25,695

As usual, large quanties of *Opius humilis* were liberated from the insectary bred from fruits collected in various sections. We have been able to recover from fruits collected in the field small quantities of *Diachasma fullawayi* and *Tetrastichus giffardii*. We are now placing fruits from many localities where the various parasites have been liberated for the purpose of getting the percentage of parasitism existing in such places.

About 200 parasites (*Leptomastix histrio*?) of the Mealybug were liberated during the month. This species has been successfully bred from the Sugarcane Mealybug (*Pseudococcus sacchari*) by Mr. O. H. Swezey in his laboratory.

Hilo Inspection.

During the month of October, Brother Matthias Newell reports the arrival of 8 steamers, of which 6 brought vegetable matter consisting of 387 lots and 6580 packages. The T. K. K. steamer Anyo Maru arrived on October 8th, direct from Japan, bringing 8248 bags of rice and 385 bags of beans, 100 bags of corn and 20 bags of peanuts. All of these shipments were found free from pests and allowed to enter the port.

Inter-Island Inspection.

During the month 51 steamers plying between Honolulu and the other islands were attended to. The following shipments were passed:

Taro	396	bags
Plants	78	packages
Vegetables	38	"
Fruit	6	"
Total bags and packages inspected	518	

The following packages were refused shipment on account of infection and also of having undesirable soil attached to the plants:

Plants	12	packages
Fruit	10	"
Total refused shipment	22	"

Respectfully submitted,

E. M. EHRHORN,
Superintendent of Entomology.

DIVISION OF FORESTRY.

Honolulu, November 17, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit the following routine report for the Division of Forestry for the month of October, 1915:

Forest Fires.

On October 6 there was a fire on the ridge between Wailupe and Niu Valleys, Oahu, which burned over a few acres of land covered with grass and lantana. A severe wind was blowing at the time, but the fire was promptly extinguished that same night by ten men whom Judge A. Perry personally conducted to the area.

Kahoolawe.

In company with Commissioner H. M. von Holt I visited the Kahoolawe Forest Reserve from October 8-11. Mr. Eben Low kindly took us over to the island in his launch and furnished us with riding horses and other accommodations while on the island. We found the island greatly benefited by the recent heavy rains, which have made the pili grass and native weeds, such as ilima and ahuloa, grow tall and rank, and by the reduction of stock which has enabled the algaroba trees and herbage to get a good start. We found these young trees in almost every situation on the island where the pili grass grows, and if they are not injured in any way they promise to become quite a forest. A part of the top of the island is still nothing but bare red dirt, but if all stock is removed from the island it is my belief that the grasses at least will encroach on the barren land. Several dozen highland ironwood trees, *Casuarina cuadrivalvis,* which Mr. Low planted on the upper part of the island at an elevation of 1200 feet in April, 1912, are well established and growing nicely, and in the same region the forage grass, *Paspalum dilitatum,* which he set out, is spreading rapidly over a large area and promises to be a good soil-binder. It is estimated that there still remain

on the island approximately three hundred wild goats and seventy-five semi-wild sheep. Definite plans for the removal of these are now being formulated.

Waianae Trip.

On October 21 I visited a portion of the Waianae-kai Forest Reserve and made a thorough investigation of the occupancy of a piece of land in this reserve by an Hawaiian, Thomas Makia. A special report on this has already been submitted to you. I also got a line on a local resident who could serve as a Forest Ranger for this district to keep up the forest fences and do other patrol work on the reserves in this locality. It is planned to have the new ranger begin work here on December 1.

Forest Fencing.

Forest Ranger Kaina D. Lovell reports that at the end of October, 3,500 feet of the fence along the forest reserve boundary at Anahola, Kauai, had been completed.

The only bid received in response to the advertisement for the construction of the fence around Section B of the Olaa Forest Park Reserve on the Volcano Road, Hawaii, was received from Mr. A. J. W. MacKenzie and amounted to $260.27. The job was, therefore, awarded to him. It is expected that this fence will be completed before the end of November.

Sale of Awa Root.

Mr. C. M. Hudson of Hilo, Hawaii, submitted the only bid for purchasing an unestimated amount of awa root in the Hamakua Pali Forest Reserve, Hawaii, and it was at the rate of three cents per pound, dry weight. The sale was, therefore, awarded to Mr. Hudson, and the agreement, which was approved on October 26, runs for one year from that date and requires the same conditions as to the planting of awa slips and the prevention of damage to forest growth as those required in the agreement with Mr. Hudson for gathering two tons of awa root in the Puna Forest Reserve, mentioned in my routine report for September.

Cattle in Nuuanu Valley.

On October 28 I was informed that there were eight head of cattle in the upper part of Nuuanu Valley on the Honolulu Watershed Forest Reserve, which had come over from Kaneohe. I at once took up the matter with Manager O. C. Ludloff of the Kaneohe Ranch Company and he informed me that these eight head had been removed from the forest reserve on October 24.

Forest Reserve Notices.

Five hundred copies of the following notice have been printed on cloth and I have begun to have them posted in conspicuous places at the boundaries and within the forest reserves on all islands:

FOREST RESERVE
BOARD OF AGRICULTURE AND FORESTRY
TERRITORY OF HAWAII

All persons are warned not to start fires or to commit any depredations on this land, under penalty of the law. The removal of any material from the Forest Reserve without a permit is prohibited.

C. S. JUDD,
Superintendent of Forestry.

It is hoped that these signs will have a beneficial effect in acquainting the public with the location of the different reserves and in mitigating the few depredations in the forests which have been occasionally reported.

Seed Distribution.

A consignment of seeds of some of our successfully introduced timber and ornamental trees has been sent to the Director of Forestry at Manila, P. I., in order to assist the Bureau of Forestry there in tree introductions.

A small consignment of seed of the karaka tree, *Corynocerous laevigata,* was received during the month through the kindness of Mr. Eric Knudsen. This tree was introduced from New Zealand by his father and planted at Halemanu, Kauai, where it has spread considerably. While not a very valuable timber tree, the karaka is believed to be a good watershed cover, and suitable for many of the wet localities at the higher elevations on these islands. It has already done well on Molokai. Young seedlings of this tree are being raised at the Government Nursery for planting at the higher elevations on this island, and seeds were distributed to Mr. W. F. Pogue and Mr. L. von Tempsky for planting on the higher elevations of Maui.

Mr. George Munro of Lanai has kindly agreed to secure for this Division, from his brother in New Zealand, seeds of many trees growing there which might do well in these Islands.

Arbor Day.

The Governor of the Territory has officially declared Friday, November 19, as Arbor Day, and already many thousands of trees have been distributed to school children and homesteaders on the other islands for planting on this day. The men at the nursery

have also been very busy in preparing for the distribution of trees for planting in and around Honolulu on Arbor Day.

Basket Willow.

A handsome wicker settee has been made by one of the Portuguese laborers of the Board from the yellow willows, *Salix vitellina,* grown at the Makiki Experiment Garden from slips introduced by Dr. L. R. Gaspar from Funchal, Madeira, in 1909. This settee has been placed on exhibition in one of the windows of the Coyne Furniture Company for a few days in order to indicate to the public the possibilities of osier culture and of a wicker furniture industry here in these islands.

Respectfully submitted,

C. S. JUDD,
Superintendent of Forestry.

FOREST NURSERYMAN'S REPORT.

Honolulu, November 22, 1915.

Superintendent of Forestry.

Dear Sir:—I herewith submit a report of the work done during the month of October, 1915:

Nursery.

Distribution of Plants.

	In seed boxes	In boxes transplanted	Pot Grown	Total
Sold	....	250	39	289
Gratis	....	150	654	804
	....	400	693	1093

Collections.

Collections on account of plants sold amounted to $3.50.

Plantation Companies and Other Corporations.

The distribution of plants under this heading amounted to 2900 in transplant boxes ready to set out.

Collection and Distribution of Seed.

Our seed collectors have been kept busy in and around the city collecting seed of flowering and forest trees. We have received from H. W. Potts, principal of the Hawkesbury Agricultural College, Richmond, New South Wales, a package of seed of choice eucalyptus and other trees. We have been requested to send sample packages of our seed in return. A package will be mailed to Mr. Potts by the first steamer going south.

Makiki Station.

Work in connection with Arbor Day and other routine work has kept the men busy during the month.

Honolulu Watershed Planting.

Owing to the rank growth of grass and other weeds which have sprung up around the recently planted trees we had to abandon the planting for a time and put the men to hoeing and clearing off. A large part of the first planted area is now safe and will not require any more attention as the trees are well above the grass and brush and are able to take care of themselves.

Advice and Assistance.

The writer has been called upon to make visits and otherwise give advice and assistance as follows: Calls made in and around city, 12; requests for advice answered by telephone, 15; requests for advice answered by letter, 4; requests for advice by people calling at the nursery, 7; total, 38.

Respectfully submitted,

DAVID HAUGHS,
Forest Nurseryman.

DIVISION OF HYDROGRAPHY.

Honolulu, November 12, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operations of the Division of Hydrography during October, 1915, is submitted:

Weather Conditions.

Rainfall was plentiful on all islands during the month, increasing in quantity towards the end of the month. All streams, ditches and reservoirs were well supplied at the end of the month.

Special Investigations.

Kipapa Ditch Losses, Oahu—On October 23, the manager of the Oahu Sugar Co., Ltd., asked if this office could make a few measurements on the Kipapa flood water ditch of that plantation, to determine seepage losses. This investigation was undertaken on October 26, and it was found necessary to extend the work over to include the 27th, in order that reliable data might be obtained. The data obtained were very valuable and resulted in the resolution, by the directors of this plantation, to expend about $40,000.00 in lining this ditch with cement or concrete. A copy of the report, with blue prints, furnished the Oahu Sugar Co., Ltd., is appended hereto.

Dry Weather Flow Between Waialae and Makapuu Point, Oahu—An investigation was made to determine the advisability of establishing weir stations in the upper valleys between Waialae and Makapuu Point, to measure the duration and quantities of flowing water in these valleys in dry weather. Inquiry of land holders and inhabitants of these valleys leads to the conclusion that there is no surface flow, except for periods of a few weeks after heavy rains, and that the expenditure of time and funds necessary for an intensive investigation of this kind is not justified. The investigation of the flow of springs near sea level in these valleys will be undertaken, as soon as weather conditions permit.

East Maui Ditch Flow—At the request of His Excellency the Governor and the Land Commissioner of Hawaii, an investigation to determine the quantities of water diverted from the areas under each of the five Territorial water and land leases on East Maui was started. In order that ditch improvement work costing about $300,000.00 may be started in the near future, an attempt is being made by the lessees of Leases Nos. 475B and 658—which terminate in 1916 and 1919 respectively—to have these leases renewed as soon as possible. The flow of streams and ditches in this region has been under investigation by this division and the U. S. Geological Survey since 1910. The East Maui Irrigation Company has furnished all data in its possession and from all data at hand an estimate of the mean flow, in million-gallons per day, diverted from the lands under each lease has been worked out. This report was completed on November 10, and copies thereof will be submitted with the regular November report.

Special Work For the Governor.

This division began the preparation of colored maps showing the Territorial lands, homesteads, Federal reservations, Territorial and private forest reserves as well as tunnels, ditches, etc., of the islands of Kauai and Maui. Tables of ditch and stream flow from Territorial lands are also being prepared. These data

and maps are to be used by the Governor as exhibits at Washington, D. C., in the near future. The work will be completed in November.

Honolulu Water Commission.

This commission has obtained and copied during the month numerous data filed in this office.

New Construction.

Kauai—Two of the three new stream measurement stations being established on the three main branches of the Waimea river, above all diversions, were completed and work on the third station was about two-thirds completed. A serious accident occurred on October 28, at this last station site, when a steel eyebolt made of one-inch diameter steel parted, and dropped D. E. Horner, field assistant, and Shima Taniguchi, laborer, onto the stream bed bowlders 18 feet below. Both men were badly bruised and shaken up, but no bones were broken. Both were taken to Waimea and both are convalescing. In compliance with the Workmen's Compensation Act, the proper papers have been completed and forwarded to the proper authorities.

Oahu—Three new reinforced concrete "controls" or broad crested weirs were completed on the Koloa, Wailele, and Kahawainui streams near Laie. These stations are maintained in coöperation with the Laie Plantation Co. to determine the flood discharge of these streams, in connection with a proposed flood water storage project in the vicinity.

1913-1915 Biennial Report.

The office and computation work progressed favorably and this report is considered as 98 per cent. complete. Blue print data for all islands will probably be available for distribution by December 31, 1915.

Leave of Absence.

G. K. Larrison, superintendent, was absent on leave October 15 to 19 as a National Guard officer in connection with the annual U. S. Army maneuvers on Oahu.

H. A. R. Austin, junior engineer, U. S. Geological Survey, was absent on leave October 7 to 31, attending the annual conference of engineers of the U. S. Geological Survey held at San Francisco, October 15 to 25.

Routine Maintenance and Operation Work.

Kauai—W. V. Hardy, assistant engineer, and D. E. Horner, field assistant, visited 15 stream and ditch and 16 rain measure-

ment stations. Ten stream and ditch measurements were made and about five miles of foot trails cleared of vegetation.

Oahu—Fifteen stream and ditch and two rainfall measurement stations were visited. Eight measurements were made at regular stations and 20 miscellaneous ditch measurements were made.

Maui—Nothing was done on Maui except to keep clock driven water registers in operation. G. K. Larrison, superintendent, visited Paia, Maui, on October 29-31, and collected ditch run-off data of the East Maui Irrigation Company.

Hawaii and Molokai—Only rainfall observations were made by coöperative observers.

Very respectfully,

G. K. Larrison,
Superintendent of Hydrography.

AN ANNOTATED REFERENCE LIST OF THE MORE COMMON TREES AND SHRUBS OF THE KONAHUANUI REGION.

By Vaughan MacCaughey, *College of Hawaii.*

The following list was originally made for use in the author's courses in dendrology and in general botany, in the College of Hawaii. It includes all of the commoner species of native trees and shrubs found in the forested mountains back of Honolulu. These mountains, of which Konahuanui is largest and highest, are frequently visited for botanical collecting and study, as well as for their scenic beauty. The forest of the mountain range proper is hydrophytic, "rain forest." The list includes the rain forest and the humid lower forest; it does not include the dry foothills and other xerophytic districts. Professor John S. Donaghho of the College of Hawaii has prepared a large map of the mountains back of Honolulu, showing contour intervals and trails.

The arrangement is alphabetical, with cross-references, giving botanic, Hawaiian and English names. The localities given under each species are typical or representative regions; the great majority of the species are abundant all along the Koolau mountain range, from Niu and Wailupe west to the forests mauka of Kahuku. The list has proved of distinct use for reference purposes, and may be of interest to readers of the Forester.

Aalii—See Dodonea.

Acacia Koa Gray—*Koa;* abundant in the lower and middle portions of the Koolau forests; occurring plentifully along ridges of Tantalus, Kalihi, Hillebrand's Glen, Pohakea, Palolo. (Legume family.)

Ae—See Zanthoxylum.

Aha-kea—See Bobea.

Aiea—See Nothocestrum.
Akia—See Wikstroemia.
Alaa—See Sideroxylon.
Ala-hee—See Plectronia.
Alani—See Pelea.

Aleurites moluccana (L.) Willd.—*Kukui*; well-known tree; the most conspicuous member of the Koolau lower forest. Abundant at the heads of all the valleys back of Honolulu, up to an elevation of about 2200 feet. (Euphorbia family.)

Antidesma platyphyllum Mann—*Hame* or *Haa;* a medium-sized tree; fairly common in the rain forest, 1500-3000 feet; Kalihi, Kahauiki, Hillebrand's Glen, Konahuanui. (Euphorbia family.)

Bobea elatior Gaud.—*Ahakea*; medium tree; fairly abundant in all parts of the Koolau rain forest; Manoa, Pauoa, Hillebrand's Glen, Kahauiki, etc. (Madder family.)

Broussaisia arguta Gaud.—*Kanawau* and *Puahanui*; very common shrub, occasionally arborescent; occurs throughout the rain forest, 1000-3000 feet; abundant around Olympus, Konahuanui, Lanihuli. (Saxifrage family.)

Charpentiera obovata Gaud.—*Papala;* medium-sized tree; plentiful throughout the Koolau range; abundant in shady protected ravines and pockets, above Woodlawn, and back of Tantalus. (Amaranth family.)

Cheirodendron Gaudichaudii (DC.) Seem—*Olapa*; common in the rain forest above 2000 feet, usually in groups; Hillebrand's Glen; Pauoa, Palolo, Olympus, etc. (Aralia family.)

Cheirodendron platyphyllum (Hook. & Arn.) Seem—*Lapa-lapa*; occurs only on the summit peaks and ridges of the Koolaus: Konahuanui, Lanihuli; not found below 2500 feet. (Aralia family.)

Cibotium Chamissoi Kaulf—*Hapu*; the small tree fern; fairly common above 1200 feet. (Tree Fern family.)

Clermontia oblongifolia Gaud—*Ohawai*; shrub or small tree, fairly common in the rain forest: Tantalus, Manoa, Pauoa, etc.

Clermontia persicaefolia Gaud—*Ohawai*; shrub or small tree, fairly common in the rain forest: Hillebrand's Glen, upper Kalihi, upper Palolo, etc. (Campanula family.)

Coprosma longifolia Gray—*Pilo;* small tree, common along the upper ridges throughout the Koolau rain forest: Konahuanui, Lanihuli, etc. (Madder family.)

Dodonaea viscosa L.—*Aalii*; small tree, occurring gregariously throughout the Koolau range, from the lower forest to the summit ridge: Waialae, Palolo, Manoa, Kahauiki, etc. (Soapberry family.)

Dubautia plantaginea Gaud—*Naenae*; shrub or small tree, common in the Koolau forests above 1800 feet: Konahuanui, etc. (Composite family.)

Ebony, Hawaiian—See Maba.

Elaeocarpus bifidus Hook & Arn.—*Kalia;* small or medium tree (30-40 ft.), fairly common along the upper ridges, and in hanging valleys, throughout the Koolau range: Lanihuli, Konahuanui, etc. (Eleaocarpus family.)

Eurya Sandwicensis Gray—*Wanini*; shrub or small tree, occurring fairly commonly in the rain forest up to the summit ridges: Konahuanui, Olympus, etc. (Tea family.)

Gardenia Remyi Mann—*Manu;* small tree, occurring here and there in the rain forest throughout the Koolaus: Tantalus, Pauoa, Palolo, Lulumahu Pohakea. (Madder family.)

Gouldia axillaris Wawra—*Manono*; small tree, throughout the Koolau range in the rain forest, most abundant near the summit ridges: Konahuanui, Olympus, etc. (Madder family.)

Haa—See Antidesma.

Hame—See Antidesma.

Hao—See Rauwolfia.

Hapu—See Cibotium.

He-ae—See Zanthoxylum.

Hesperomannia arborescens Gray—Shrub or small tree; occurs here and there along summit ridges and peaks of the Koolaus. (Composite family.)

Hibiscus Arnottianus Gray—*Kokia Keokeo;* native white hibiscus; a tall shrub or small tree; on slopes and along stream beds throughout the Koolau rain forest: Tantalus, upper Manoa, Hillebrand's Glen, Lulu-mahu, etc. (Cotton family.)

Ho-awa—See Pittosporum.

Hydrangea, Hawaiian—See Broussaisia.

Ilex Sandwicensis (Endl.) Loes—*Kawau*; small to medium tree; very common throughout the rain forest; abundant on the upper ridges and slopes of Konahuanui, Olympus, Tantalus, etc. (Aquifolia family.)

Ili-ahi—See Santalum.

Ironwood, Hawaiian—See Rauwolfia.

Jambosa malaccensis (L.) P.EC.—*Ohia ai;* Mountain Apple; well-known tree; gregarious in valleys and gulches along mountain streams: Moanalua, Pauoa, Hillebrand's Glen, Palapu, Ohuohi. (Myrtle family.)

Kalia—See Elaeocarpus.

Ka-maka-hala—See Labordia.

Kana-wau—See Broussaisia.

Ka-wau—See Ilex.

Koa—See Acacia Koa.

Kokia Keo-keo—See Hibiscus.

Kolea—See Suttonia lessertiana.

Kolea lau-lii—See Suttonia Sandwicensis.

Ko-piko—See Straussia.

Ko-piko Kea—See Straussia Kaduana.

Ku-kui—See Aleurites.

Labordia membranacea Mann—*Kamakahala;* small tree, fairly common in the rain forest: Olympus, upper Manoa, Konahuanui, Lulu-mahu, Lanihuli, etc. (Logania family.)

Labordia seesilio Gray; medium tree; confined to the Koolau rain forest, particularly along the summit ridges: Olympus, Manoa trail, Konahuanui, Lanihuli, etc.

Lama—See Maba.

Lehua ahihi—See Metrosideros tremuloides.

Lehua papa—See Metrosideros.

Loulu hiwa—See Pritchardia.

Maba Sandwicensis A.DC.—*Lama;* medium tree; occurs plentifully throughout the Koolau rain forest: upper Manoa, upper Nuuanu, upper Kalihi, etc. (Ebony family.)

Ma-maki—See Pipturus.

Ma-no-no—See Gouldia.

Maua—See Xylosma.

Metrosideros macropus Hook & Arn.—*Ohia lehua*; a large tree, occurring here and there in the rain forest, but uncommon as compared with *polymorpha,* Lulu-mahu, Kalihi, Moanalua.

Metrosideros polymorpha Gaud.—*Ohia lehua*; shrubby or medium tree, very common on ridges and valley slopes throughout the Koolau range: Tantalus, upper Manoa, Olympus, etc. (Myrtle family.)

Metrosideros rugosa Gray—*Lehua papa;* small tree or shrub, growing on exposed ridge combs, windward cliffs and pockets, along the Koolau range.

Metrosideros tremuloides (Heller) Rock—*Lehua ahihi;* small tree on ridges and slopes throughout the Konahuanui region —Tantalus, Lanihuli, etc.—at 1000-2000 feet elevation.

Mountain Apple—See Jambosa.

Myoporum Sandwicense (DC.) Gray—*Naio;* common forest tree, in sheltered places on slopes and in valley heads: Kalihi, upper Nuuanu, Pauoa, Tantalus, Manoa, etc. (Myoporum family.)

Naio—See Myoporum.

Nae-nae—See Dubautia.

Nanu—See Gardenia.

Nau-paka—See Scaevola.

Nothocestrum longifolium Gray—*Aiea*; shrub or small tree; fairly common in the Koolau rain forest: Tantalus, Olympus, Hillebrand's Glen, etc. (Potato family.)

Oha-wai—See Clermontia.

Ohe mauka—See Tetraplasandra.

Ohe-ohe—See Petrotropia.

Ohia ai—See Jambosa.

Ohia lehua—See Metrosideros polymorpha.

Olapa—See Cheirodendron Gaudichaudii.

Olive, Hawaiian—See Osmanthus.

Olo-mea—See Perrottetia.

Olopua—See Osmanthus.

Opuhe—See Urera.

Osmanthus Sandwicensis (Gray) Knobl.—*Olopua* or *Pua;* Hawaiian Olive; occurs here and there in the lower forest zone; Tantalus, Palolo, Waialae, Kalihi. (Olive family.)

Palm, native fan—See Pritchardia. The botanic status of the various native fan palms (*loulu*) is still unsettled.

Pa-pala—See Charpentiera.

Pa-pala Ke-pau—See Pisonia.

Pelea clusiaefolia Gray—*Alani;* small to medium tree, common throughout the Koolau Range at 1800-2400 feet; plentiful in upper Palolo, Lulumahu, Hillebrand's glen (Rue family).

Pelea rotundifolia Gray; shrub or small tree, fairly abundant here and there throughout the Koolau rain forest; occurs on Tantalus, Olympus, Konahuanui, etc. (Rue family.)

Pelea Wawreana Rock; small tree; fairly common along the Koolau ridges at 1800 to 2500 feet; Tantalus, Manoa, Konahuanui, Lanihuli, etc. (Rue family.)

Perrottetia Sandwicensis Gray—*Olomea;* tall shrub or small tree; common in the forests above an elevation of 1000 feet; Kahau-iki, Lulu-mahu, Tantalus, Manoa, Ka-au, etc. (Celastrus family.)

Pilo—See Coprosma.

Pilo Kea—See Platydesma.

Pipturus albidus A. Gray—*Mamaki.* Tall straggling shrub, abundant above 1000 feet, on valley slopes and protected places. Abundant in the lower forest at the head of Manoa Valley. (Nettle family.)

Pisonia umbellifera (Forst.) Seem; *Papala Kepau;* a small tree, abundant in the lower forest zone, on slopes and ridges. Gregarious in such places as Tantalus, Lulu-mahu, Ohu-ohi, and Hillebrand's Glen. (Four O'clock family.)

Pittosporum glabrum Hook. & Arn.—*Hoawa;* small tree, quite common on Konahuanui, Lanihuli, Olympus, and at the heads of Pauoa, Manoa, Palolo, Waialae, etc., at an elevation of 1800-2200 feet. (Pittosporum family.)

Pittosporum Spathulatum Mann—*Hoawa;* shrub or small tree; abundant in the upper rain forests of the Koolau range; plentiful on Lanihuli, Konahuanui, Olympus. (Pittosporum family.)

Platydesma campanulatum Mann.—*Pilo Kea;* shrub or small tree; abundant throughout the Koolau rain forest; Konahuanui, Olympus, Lanihuli, Lulu-mahu, Hillebrand's Glen, etc. (Rue family.)

Plectronia odorata (Forst.) F. v. M.—*Ala-hee;* shrub or small tree, common and gregarious in many parts of the lower forest zone, up to 1800 feet; Waialae, Manoa, Nuuanu, Kalihi, Kalaniki. (Madder family.)

Pritchardia Martii H. Wendl.—*Loulu hiwa;* a native fan palm; occurs solitary and in clumps on windward palis, near the main ridge, and at the heads of valleys. (Palm family.)

Psychotria hexandra Mann—small tree, occurring scatteringly throughout the Koolau rain forest; Olympus, upper Manoa, Konahuanui, Lanihuli, etc. (Madder family.)

Pterotropia gymnocarpa Hbd.—*Ohe-ohe;* small to medium tree; throughout the rain forest along the main ridge; Konahuanui, Lanihuli, Olympus, etc. (Aralie family.)

Pua—See Osmanthus.

Pua-ha-nui—See Broussaisia.

Pu-Keawe—See Stylphelia.

Rauwolfia Sandwicensis A. DC.—*Hao;* medium shrub or small tree; in drier parts of the forest at 1800-2200 feet. Kalihi, Ka-hau-iki, Tantalus, Waialae. (Dogbane family.)

Sandalwood—See Santalum.

Sandalwood—Bastard—See Myoporum.

Santalum ellipticum Gaud.—*Iliahi*—Elliptic-leaved Sandalwood; a small tree; plentiful in the lower forest zone of Waialae, Palolo, Pauoa, and Hillebrand's Glen. (Sandalwood family.)

Scaevola Chamissoniana Gaud.—*Naupaka;* large shrub or small tree, abundant in the lower and middle forests throughout the Koolau Range. (Goodenia family.)

Sideroxylon Sandwicense (Gray) Benth. & Hook.—*Alaa;* small to large tree; Hillebrand's Glen, Lulu-mahu, upper Pauoa, upper Manoa, Palolo, etc. (Sapota family.)

Straussia Fauriei Levl.—*Kopiko;* shrub, occurring here and there on exposed ridges and summit peaks; Konahuanui, Lanihuli, etc.

Straussia Kaduana (Cham. & Schlecht) Gray.—*Kopiko Kea;* small tree; common in the rain forest; Pauoa, Lulimahu and Hillebrand's Glen, etc. (Madder family.)

Styphelia tamieamiea F. Muell.—*Pukeawe;* a small or medium shrub, growing on exposed ridges, common; gregarious; Olympus trail, Woodlawn ridges, Tantalus, Lanihuli, etc. (Epacris family.)

Suttonia lessertiana (A. DC.) Mez.—*Kolea;* medium shrub to large tree; common in the rain forest above 2000 feet; Waialae, Palolo, Tantalus region, Kalihi, Kahauiki, etc. (Myrsine family.)

Suttonia Sandwicensis (A. DC.) Mez.—*Kolea lau-lii;* shrub, plentiful throughout the rain forest, above 2500 feet; Lanihuli, Konahuanui, Olympus, etc.

Tetraplasandra meindra (Hillebr.) Harms; small to medium tree; in hanging valleys and on upper slopes of main ridge; Lulu-mahu, Konahuanui, Palolo, etc.

Tetraplasandra Oahuensis (Gray) Harms—*Ohe mauka;* a small tree, not abundant, solitary; occurs in Pauoa, Nuuanu, Kalihi, and on Lanihuli and Konahuanui. (Aralia family.)

Tree fern—See Cibotium.

Tree-thistle, Hawaiian—See Hesperomannia.

Urera Sandwicensis Wedd.—*Opuhe;* tall shrub or small tree; fairly common; growing on valley slopes. Frequent in Hillebrand's Glen. (Nettle family.)

Wala-hee—See Plestronia.

Wa-nini—See Eurya.

Wikstroemia Oahuensis (Gray) Rock—*Akia;* small shrub or small tree, occurring from the lower edge of the forest up to the summit peaks; Waialae, Palôlo, Konahuanui, Kahau-iki, etc. (Mezereum family.)

Xylosma Hawaiiense Seem.—*Maua;* shrub to small tree; fairly common in the rain forest, at 1800-2200 feet elevation; upper Nuuanu, Pauoa, Manoa, etc. (Flacourtia family.)

Zanthoxylum Oahuense Hbd.—*Ae* or *He-ae;* a small tree, occurring here and there alone or in small clumps along the upper ridges of the Koolaus. There are several clumps on the summit of Konahuanui, also on Lanihuli. (Rue family.)

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G. K. LARRISON,
Superintendent of Hydrography.